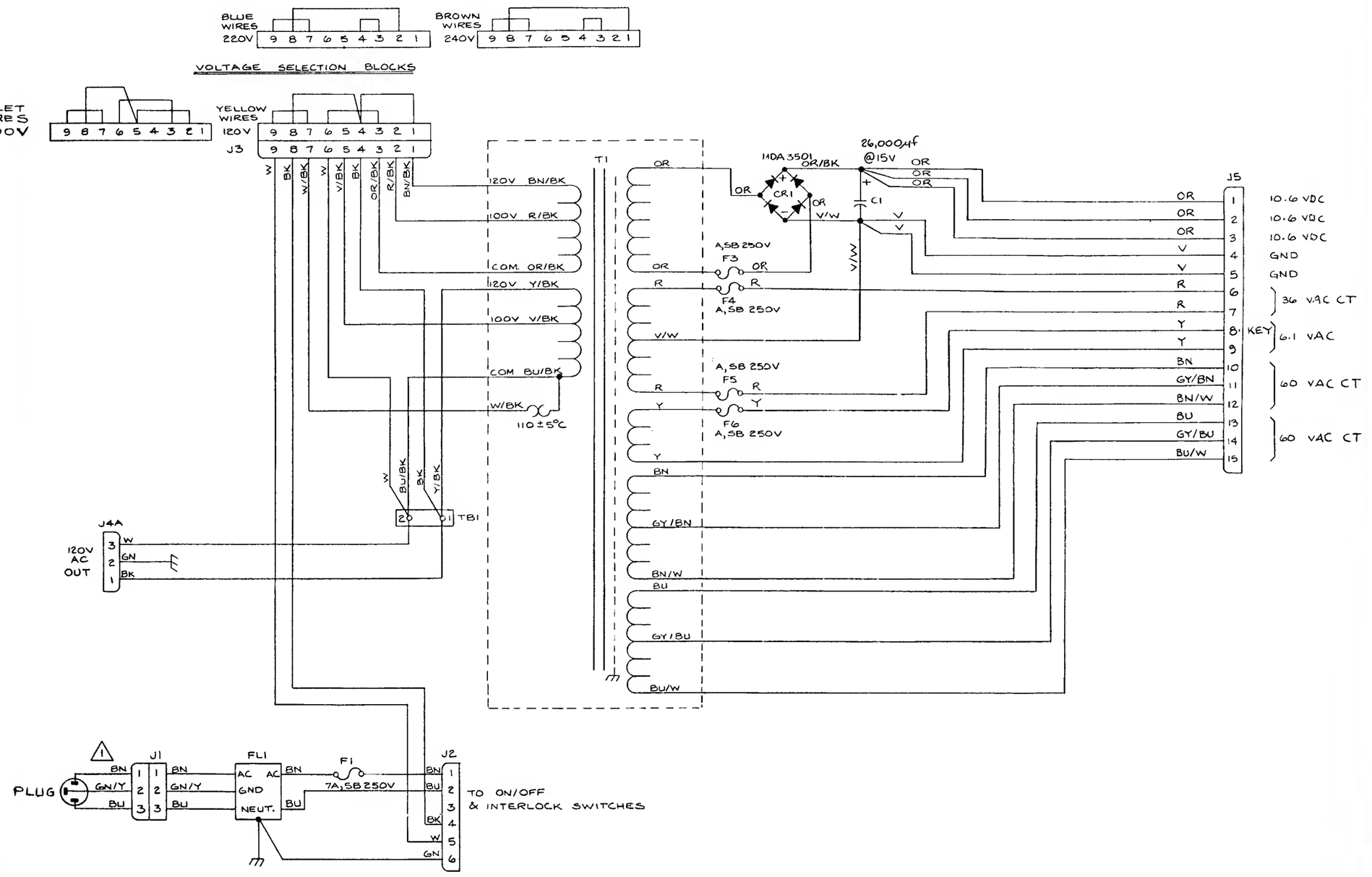
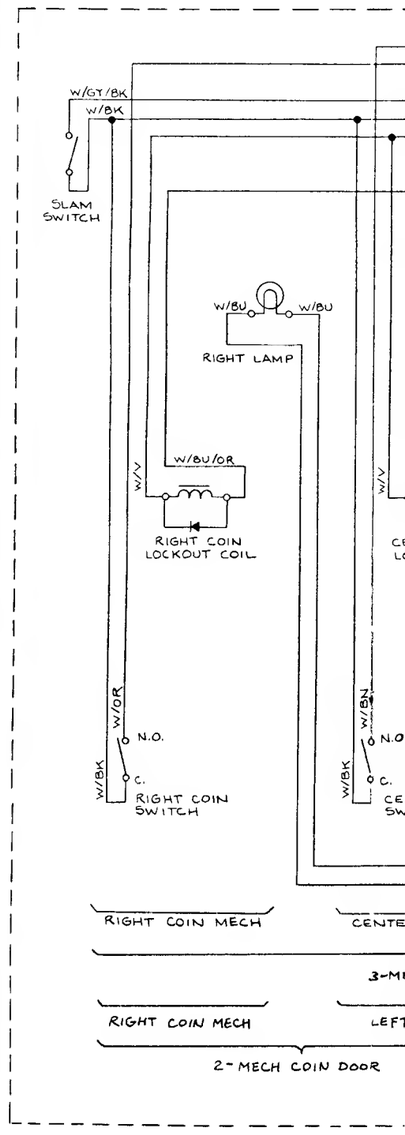
INTERNATIONAL POWER SUPPLY SCHEMATIC (035887-01) A



COIN DOOR SCHEMATIC



ATARI®

Drawing Package Supplement

to

BATTLEZONE™

Operation, Maintenance, and Service Manual

Contents of this Drawing Package

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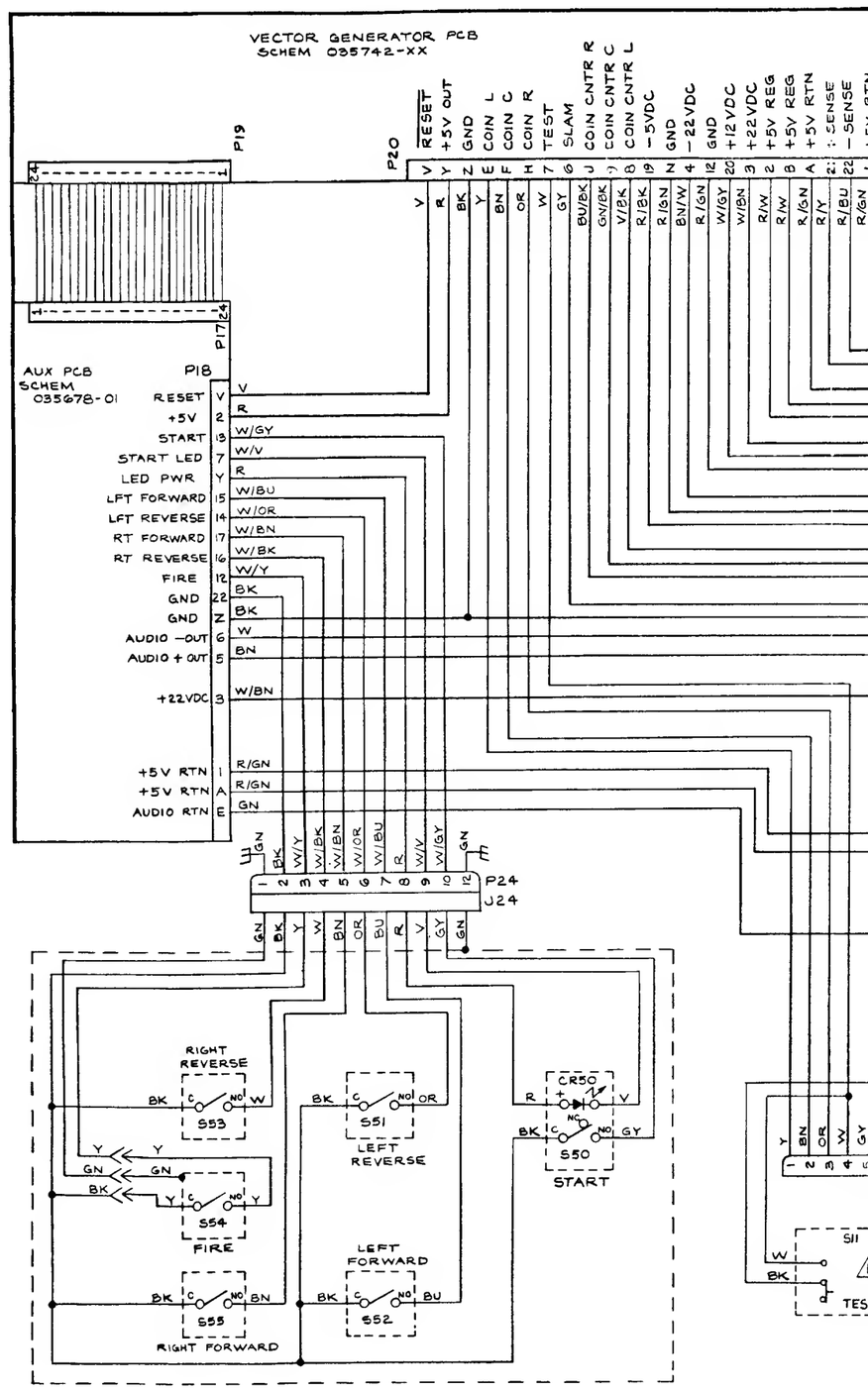
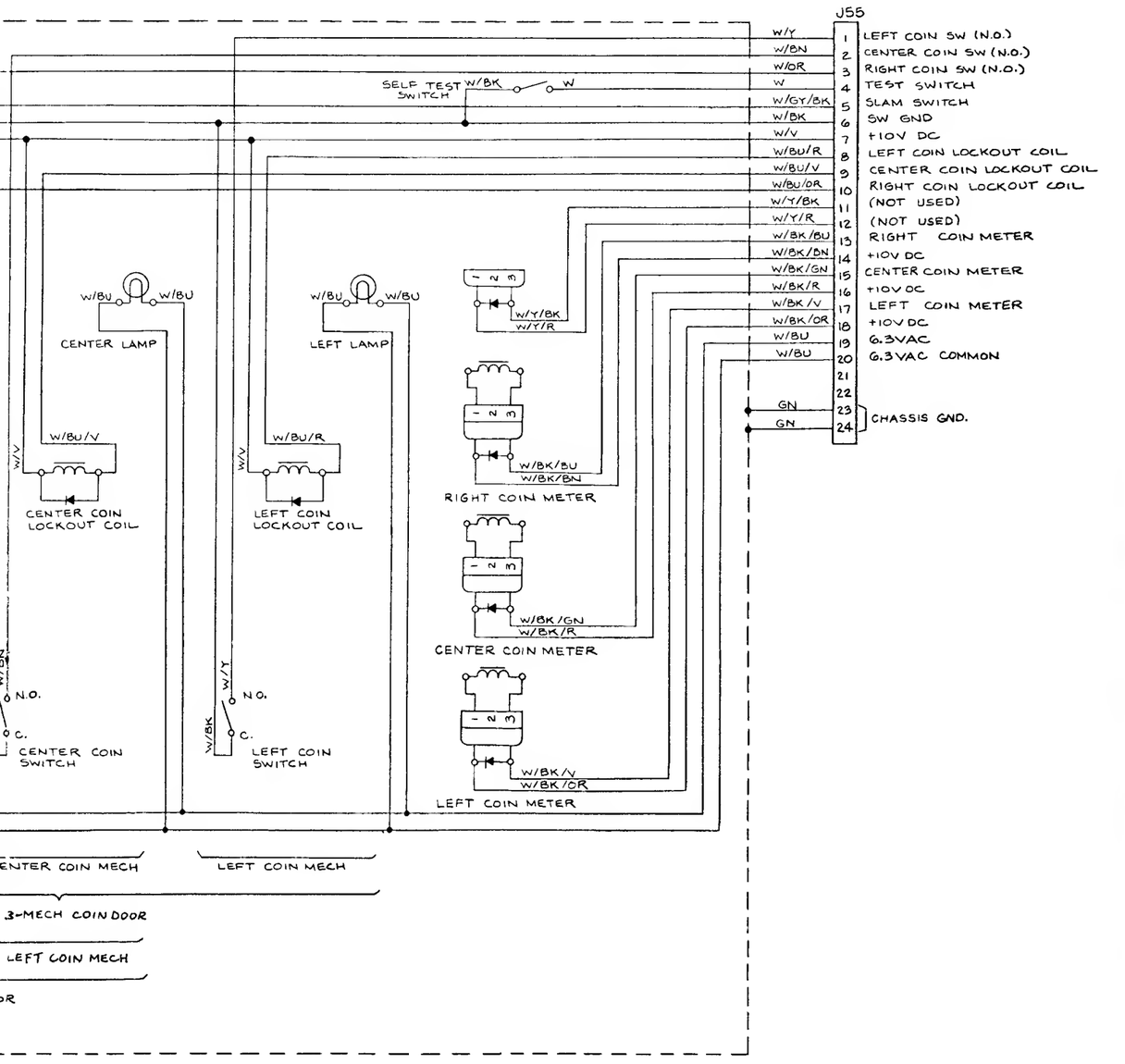
Sheet 1, Side A
DP-156-01 2nd printing

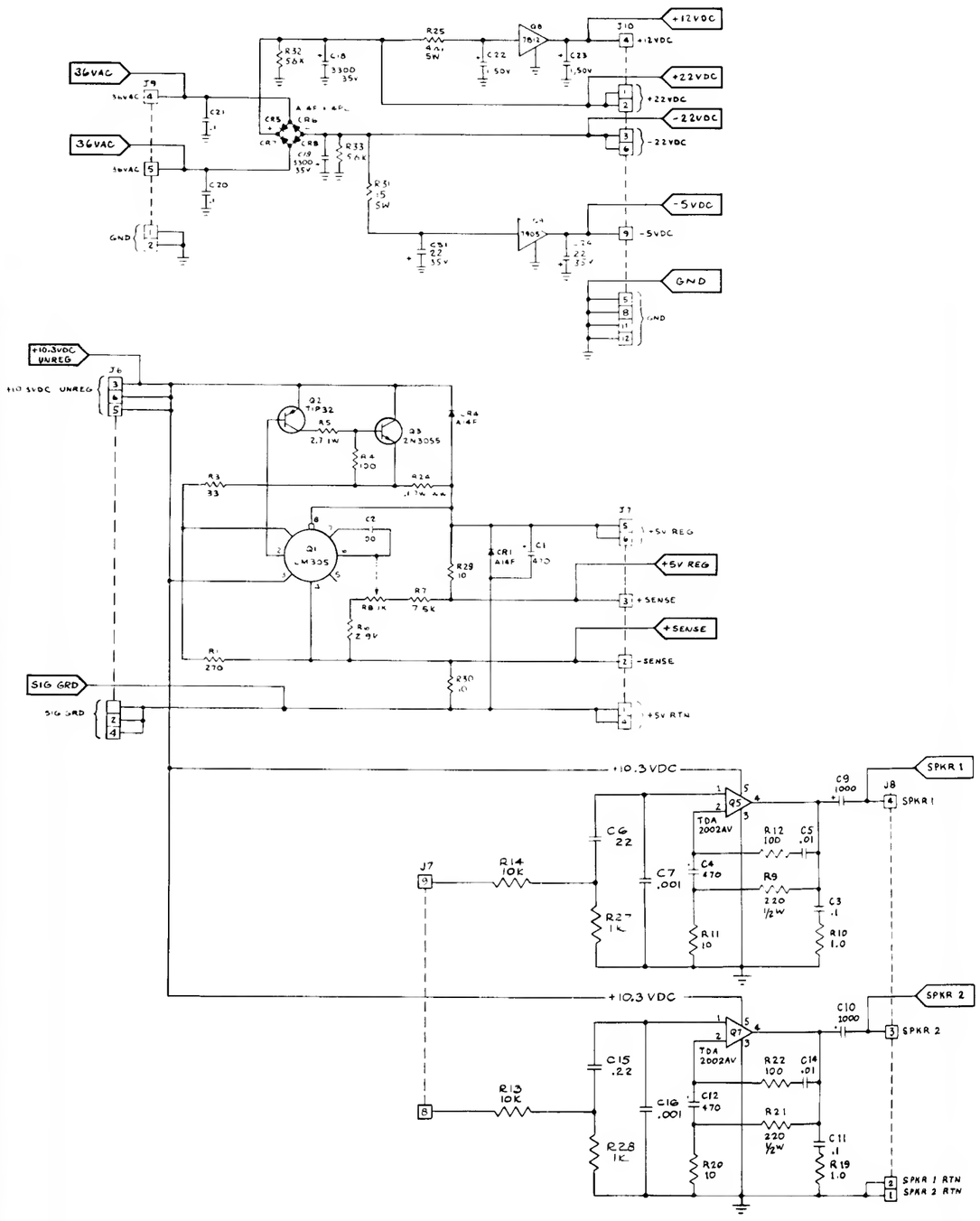
BATTLEZONE WIRING DIAGRAM (036242-01 C)



TIC (034988-01) A



REGULATOR AUDIO II PCB SCHEMATIC (035435-02 C)



The Regulator/Audio PCB has the dual functions of regulating the +5 VDC logic power to the game PCB and amplifying the audio from the game PCB.

Regulator Circuit

The regulator consists of voltage regulator Q1, current source power transistor Q3 and Q3's bias transistor Q2. The regulator accurately regulates the logic power input to the game PCB by monitoring the voltage through high impedance inputs +SENSE and −SENSE. The inputs are directly from the +5 VDC and ground inputs to the game PCB. Therefore, the regulator regulates the voltage on the game PCB. This eliminates a reduced voltage due to IR buildup on the wire harness between the regulator and the game PCB. Variable resistor R8 is adjusted for the +5 VDC on the game PCB. Once adjusted, the voltage at the input of the game PCB will remain constant at this voltage.

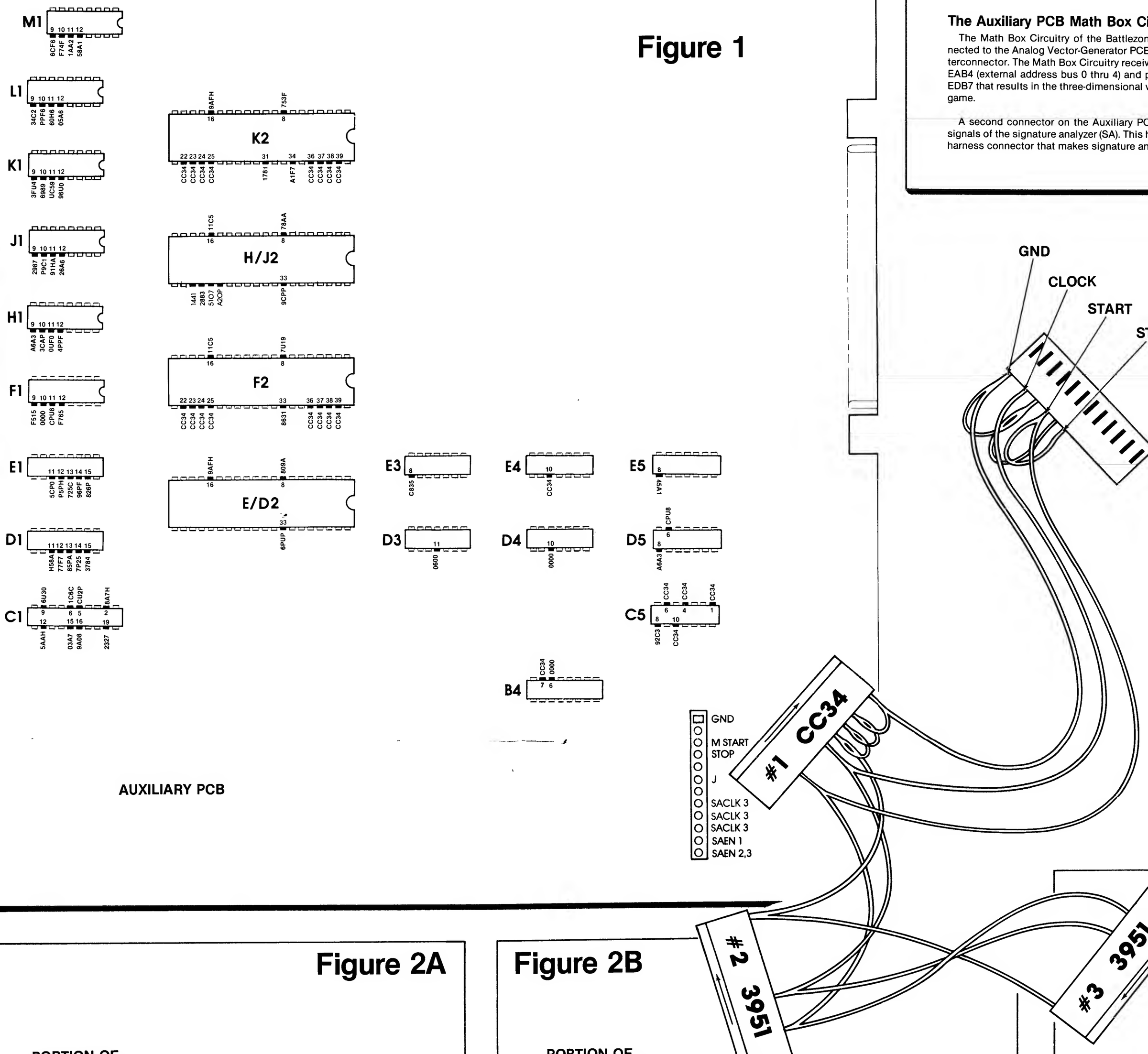
Regulator Adjustment

1. Connect a voltmeter between +5 V and GND test points of the game PCB.
2. Adjust variable resistor R8 on the Regulator/Audio PCB for +5 VDC reading on the voltmeter.
3. Connect a voltmeter between +5 V REG and GND on the Regulator/Audio PCB. Voltage reading shall not be greater than +5.5 VDC. If greater, try cleaning edge connectors on both the game PCB and the Regulator/Audio PCB.
4. If cleaning PCB edge connectors doesn't decrease voltage difference, connect minus lead of voltmeter to GND test point of Regulator/Audio PCB and plus lead to GND test point of game PCB. Note the voltage. Now connect minus lead of voltmeter to +5 REG test point on Regulator/Audio PCB and plus lead to +5 V test point on game PCB. From this you can see which harness circuit is dropping the voltage. Troubleshoot the appropriate harness wire or harness connector.

Audio Circuit

The audio circuit contains two independent audio amplifiers. Each consists of a TDA2002AV amplifier with a gain of ten.

Figure 1



The Auxiliary PCB Math Box Circu

The Math Box Circuitry of the Battlezone Au
nected to the Analog Vector-Generator PCB via t
terconnector. The Math Box Circuitry receives ad
EAB4 (external address bus 0 thru 4) and provid
EDB7 that results in the three-dimensional video
game.

A second connector on the Auxiliary PCB co
signals of the signature analyzer (SA). This heade
harness connector that makes signature analysi

Figure 2A

PORTION OF
AUXILIARY PCB

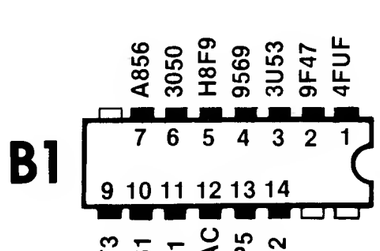
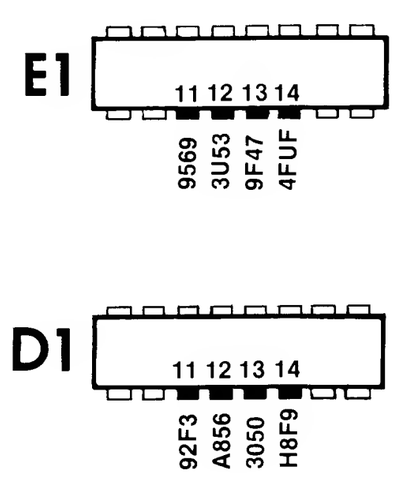


Figure 2B

PORTION OF
AUXILIARY PCB



cuitry

Auxiliary PCB is con-
ia the PCB harness in-
s addresses EAB0 thru
ovides data EDB0 thru
eo of the Battlezone™

connects the control
ader accepts a special
ysis extremely easy.

OP

Signature Analysis of the Math Box Circuitry

During the self-test procedure, the Math Box Circuitry is quizzed. **T** displayed in the upper right-hand corner of the self-test video display indicates that the Math Box Circuitry does not answer the question in the amount of time expected. Therefore, a **T** indicates a Math Box Circuitry failure.

Due to the complexity of this circuitry, we offer signature analysis as a simple means of isolating failing circuits. Signatures for this circuitry are presented in two forms:

1) at the actual test points in the Auxiliary PCB Math Box Circuitry schematic diagram (on Sheet 3, Side B), and
2) for your convenience, on the detail drawing of the Auxiliary PCB to the left of this text.

Since the Analog Vector-Generator PCB must be connected to the Auxiliary PCB, you may take signatures while the PCBs are installed in the game.

The following is the procedure for signature analysis of the Math Box Circuitry of the Auxiliary PCB:

A. Equipment Required:

1. Signature Analyzer (one of the following):

   Atari C•A•T Computer-Assisted Troubleshooter. This is a signature analyzer and a RAM/ROM tester combined. For more information contact Atari, Inc., Field Service/Coin-Op Division, P.O. Box 427, Sunnyvale, CA 94086.

   OR

   Kurz-Kasch Signature II signature analyzer. For more information contact Kurz-Kasch, 711 Hunter Drive, Wilmington, Ohio 45117.

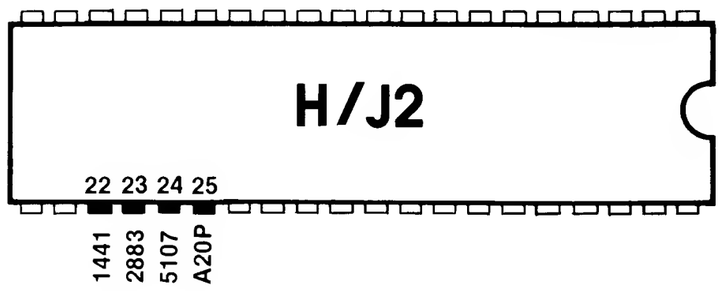
   OR

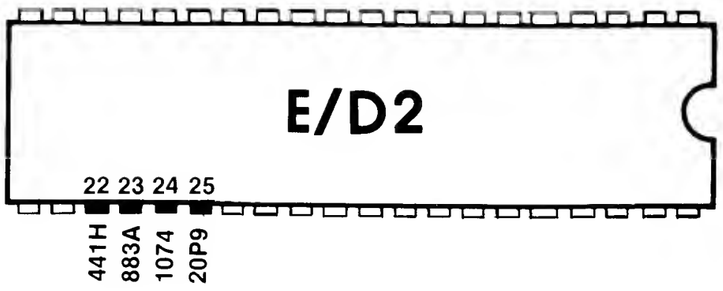
   Hewlett-Packard Model 5004A signature analyzer. For more information contact Hewlett-Packard, Scientific Instruments Div., 1501 Page Mill Road, Palo Alto, CA 94304.

   For local dealers, check the Yellow Pages under "Electronic Equipment and Supplies."

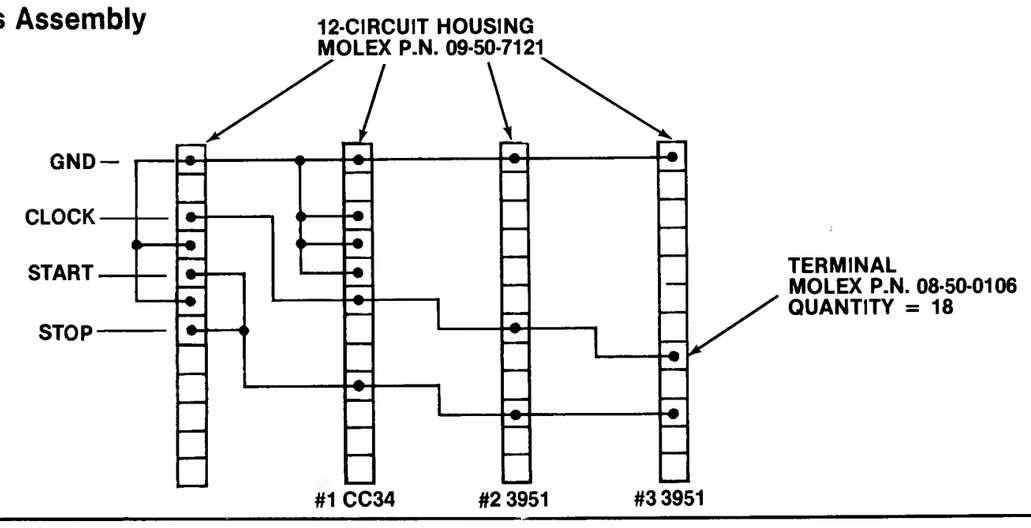
Figure 3

PORTION OF AUXILIARY PCB





S.A. Harness Assembly



2. SA Harness Assembly:

   Atari part number A036836-01. You can make one of these yourself. Above is an illustration of its construction.

3. Three jumper wires with "hook" connectors on each end.

4. Pullup resistor as follows: 1K to 1.5K ohm, ¼ watt resistor.

B. Signature Analysis Setup Procedure

1. Connect Signature Analyzer to the matching pins of SA connector on the SA Harness assembly. In other words, GND should match up with GND, etc.

2. Set Self-Test Switch of Battlezone™ game to ON. After approximately three seconds, the TV monitor should display the self-test pattern.

3. Jumper top end of 1K-ohm resistor R129 (located immediately between and below C [center] and L [left] COIN test points) of Analog Vector-Generator PCB to ground five times, or until video display is blank. You will hear a short beep after the 5th grounding; also, the screen will display only a tiny dot in its center. **NOTE:** To avoid accidentally turning off the game by brushing against the interlock switch, we recommend putting tape over the switch.

   Alternate: Jumper pin 5 of Analog Vector-Generator PCB edge-connector J20 to ground five times, or until video display is blank.

C. Signature Analysis Test #1 Procedure

1. Plug SA Harness Assembly Test #1 connector onto Signal Analyzer header on Auxiliary PCB (the black wire on the connector should be at the top).

2. Connect a jumper between pin 1 of IC B6 on the Analog Vector-Generator PCB and ground. This places a continuous RESET to the microprocessor on the Analog Vector-Generator PCB.

3. Set Signature Analyzer START to _/‾ , STOP to _/‾ , and CLOCK to _/‾ .

4. Connect a jumper wire to each end of a 1K to 1.5K-ohm resistor. Connect one jumper wire to +5V test point on Auxiliary PCB. Connect other jumper wire to the tip of the Signature Analyzer probe.

5. Verify that setup procedure was correct by probing (touching probe to) the +5V test point. The Signature Analyzer should indicate **CC34**. If not **CC34**, remove the jumper from pin 1 of IC B6. Return to *B. Signature Analysis Setup Procedure* and once again do step 3.

6. Probe for signatures as shown in Figure 1 to the left. If all signatures are correct, continue with *D. Signature Analysis Test #2A Procedure.* If any signatures are incorrect, probe for signature of **CC34** on +5V test point. If not **CC34**, remove jumper from pin 1 of IC B6. Return to *B. Signature Analysis Setup Procedure* and once again do step 3. If +5V is **CC34**, refer to *G. Isolating a Failing Circuit.*

D. Signature Analysis Test #2A Procedure

1. Remove 1K to 1.5K-ohm jumper wire from Signature Analyzer probe.

2. Plug SA Harness Assembly Test #2 connector onto Signature Analyzer header on Auxiliary PCB.

3. Remove jumper from pin 1 of IC B6 on the Analog Vector-Generator PCB.

4. Set Signature Analyzer START to _/‾ , STOP to ‾_, and CLOCK to _/‾ .

5. Verify that setup procedure was correct by probing +5V for a signature of **3951**. If not **3951**, return to *B. Signature Analysis Setup Procedure* and once again do step 3, then return to this step.

6. Probe for signatures as shown in Figure #2A to the left. If all signatures are correct, continue with *E. Signature Analysis Test #2B Procedure.* If a signature is incorrect, refer to *G. Isolating a Failing Circuit.*

E. Signature Analysis Test #2B Procedure

1. Make sure the SA Harness Assembly Test #2 connector is plugged onto Signature Analyzer header on Auxiliary PCB.

2. Make sure jumper is removed from pin 1 of IC B6 on the Analog Vector-Generator PCB.

3. Set Signature Analyzer START to _/‾ , STOP to ‾_, and CLOCK to ‾_.

4. Verify that setup procedure was correct by probing +5V for a signature of **3951**. If not **3951**, return to *B. Signature Analysis Setup Procedure* and once again do step 3, then return to this step.

5. Probe for signatures as shown in Figure #2B to the left. If all signatures are correct, continue with *F. Signature Analysis Test #3 Procedure.* If a signature is incorrect, refer to *G. Isolating a Failing Circuit.*

F. Signature Analysis Test #3 Procedure

1. Plug SA Harness Assembly Test #3 connector onto Signature Analyzer header on Auxiliary PCB.

2. Make sure jumper is removed from pin 1 of IC B6 on the Analog Vector-Generator PCB.

3. Set Signature Analyzer START to _/‾ , STOP to ‾_, and CLOCK to _/‾.

4. Verify that setup procedure was correct by probing +5V for **3951**. If not **3951**, return to *B. Signature Analysis Setup Procedure* and once again do step 3, then return to this step.

5. Probe for signatures as shown in Figure #3 to the left. If all signatures are correct, then Math Box Circuitry of Analog Vector-Generator PCB is OK.

G. Isolating a Failing Circuit

If you find an incorrect signature, find the signature test point of the Math Box Circuitry on Sheet 3, Side B. Locate the IC from which the signature is being output. Check all inputs of that IC.

If all input signatures are correct: Remove the Auxiliary PCB from the circuit. Check the circuit traces common to the failing IC pin on both the top and bottom of the PCB for shorts to another circuit trace. If the circuit traces are not shorted, then replace the failing IC.

If an input signature is incorrect: Locate on the schematic the IC source of the failing signature. Check the input signatures of that IC. If all input signatures are correct, then that is the failing IC. If this IC has a failing input signature, then continue "upstream" in the circuit flow until the failing IC is isolated.

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Sheet 1, Side B

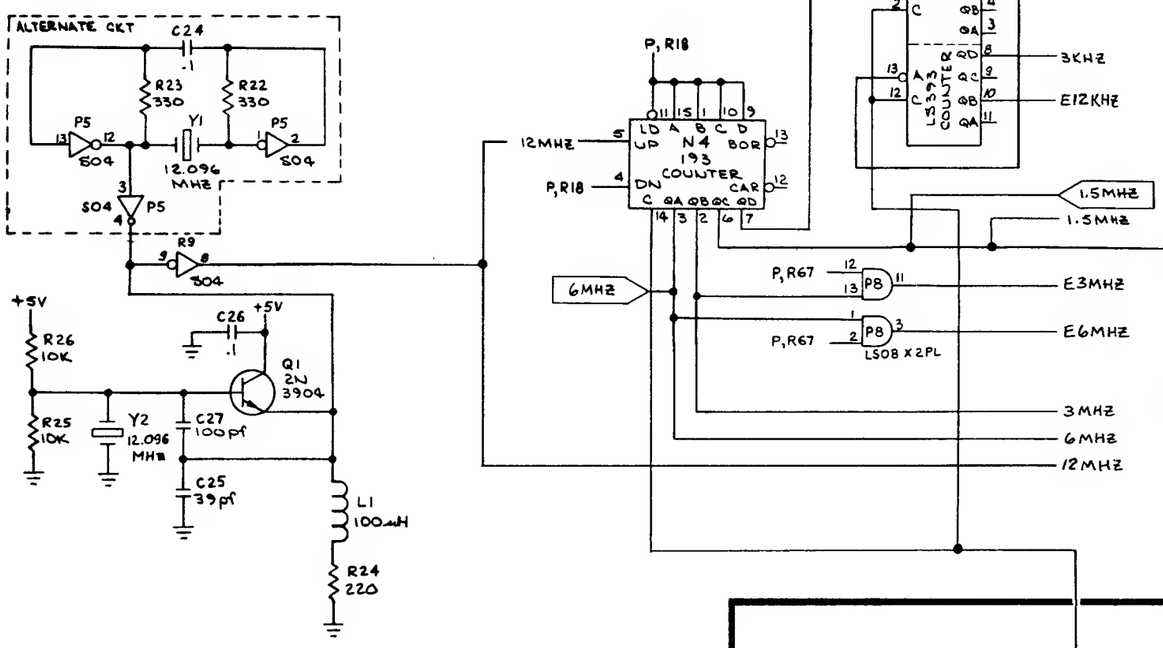
BATTLEZONE™

Auxiliary PCB

Signature Analysis Procedure

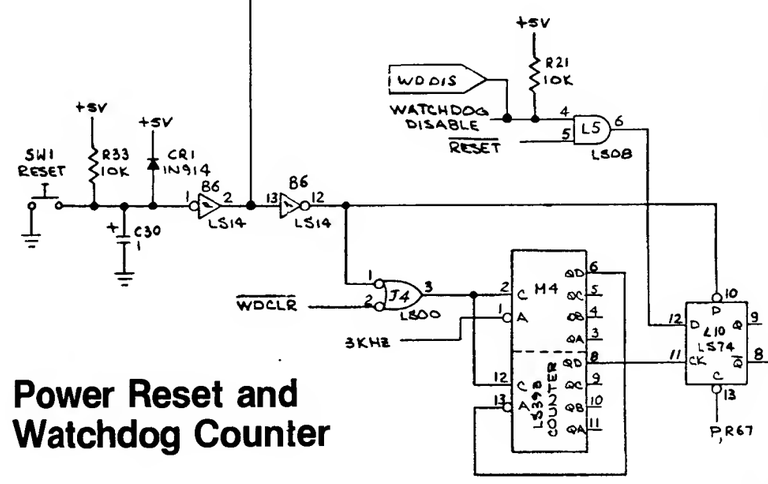
Section of 035678-01 B

Clock

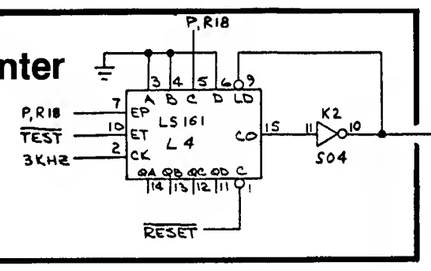


Power Input

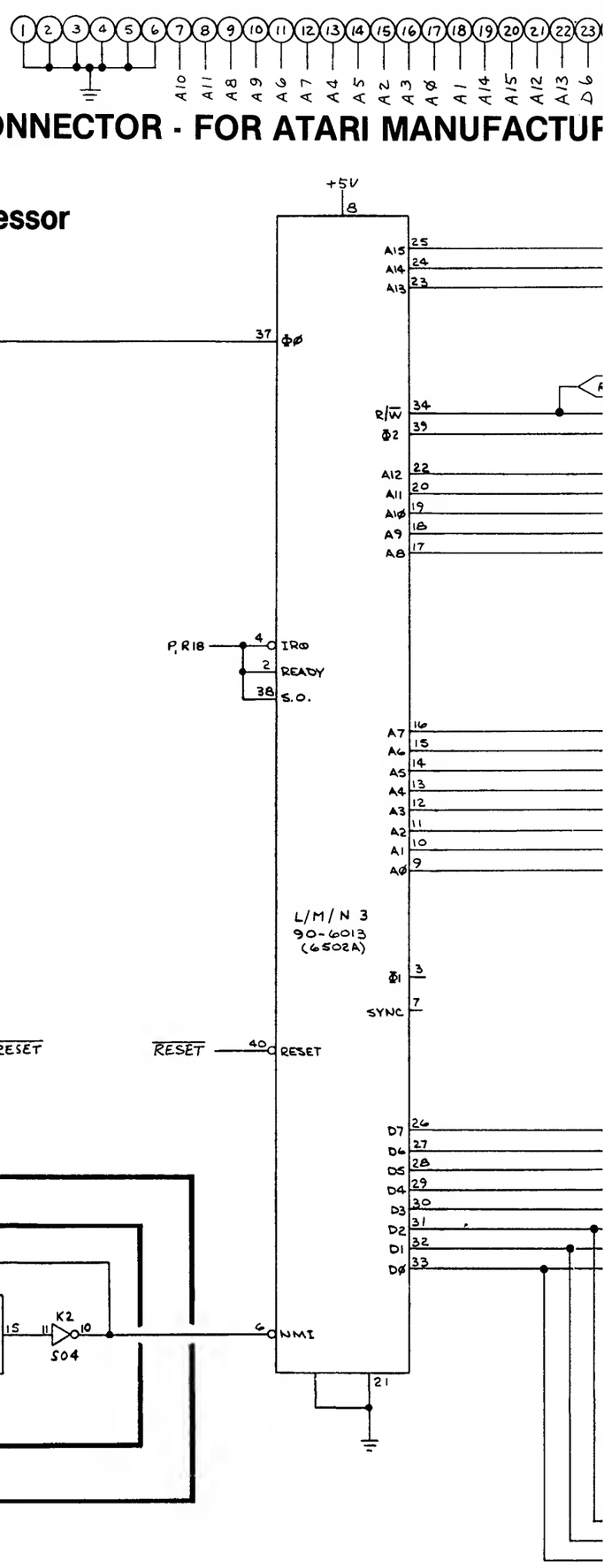
Power Reset and Watchdog Counter



NMI Counter



Microprocessor



MEMORY MAP

HEXADECIMAL	ADDRESS A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	R/W	DATA D7	D6	D5	D4	D3	D2
0000-03FF	0	0	0	0		A	A	A	A	A	A	A	A	A	A		D	D	D	D	D	D
0800	0	0	0	1	0	0											R						
	0	0	0	1	0	0											R						
	0	0	0	1	0	0											R						D
	0	0	0	1	0	0											R				D		
	0	0	0	1	0	0											R				D		
	0	0	0	1	0	0											R			D			
	0	0	0	1	0	0											R		D				
	0	0	0	1	0	0											R	D					
0A00	0	0	0	1	0	1											R	D	D	D	D	D	D
0C00	0	0	0	1	1	0											R	D	D	D	D	D	D
1000	0	0	1	0	0	0											W						
	0	0	1	0	0	0											W						
	0	0	1	0	0	0											W						D
	0	0	1	0	0	0											W				D		
	0	0	1	0	0	0											W			D			
1200	0	0	1	0	0	1											W						
1400	0	0	1	0	1	0											W						
1600	0	0	1	0	1	1											W						
1800-187F	0	1	1	1						A	A	A	A	A	A	A		D	D	D	D	D	D
2000-27FF	0	1	0	0	A	A	A	A	A	A	A	A	A	A	A	A		D	D	D	D	D	D
2800-2FFF	0	1	0	1	A	A	A	A	A	A	A	A	A	A	A	A		D	D	D	D	D	D
3000-3FFF	0	1	1	A	A	A	A	A	A	A	A	A	A	A	A	A	R	D	D	D	D	D	D
5000-5FFF	1	0	1	A	A	A	A	A	A	A	A	A	A	A	A	A	R	D	D	D	D	D	D
6000-7FFF	1	1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	R	D	D	D	D	D	D

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Sheet 2, Side A

BATTLEZONE™

Game Microprocessor

Game Address Decoding Circuitry

Analog Vector-Generator PCB Power Input

Clock

NMI Counter

Power Reset and Watchdog Counter

Game Program Memory

Game RAM

Game Memory Map

Section of 035742-01 & -02 B

CTURING ONLY

Address Decoder

RAM Memory

Program Memory

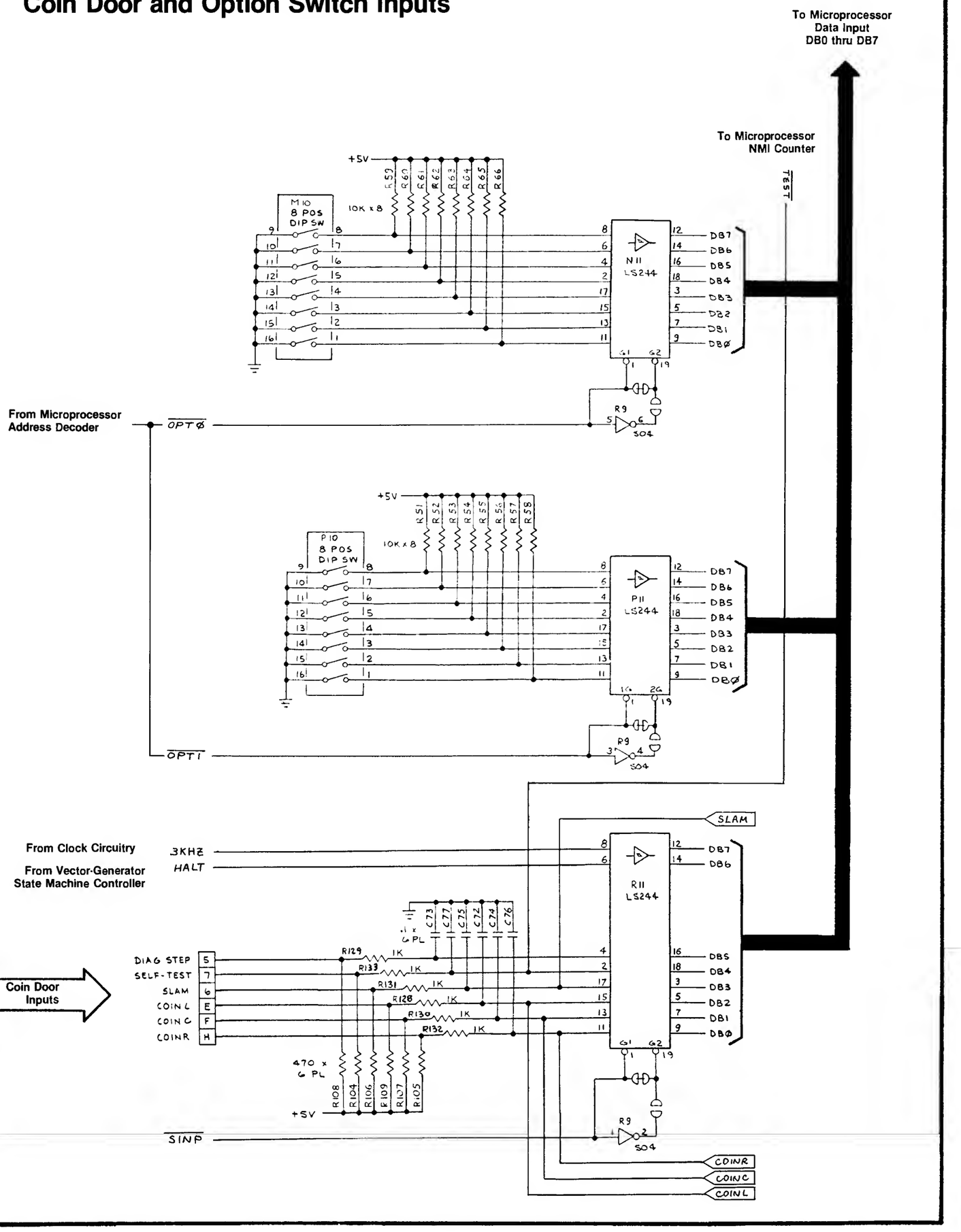
NOTE:
* USE NUMBERS IN PARENTHESES IF BOARD CONTAINS AM8304B INSTEAD OF 74LS245, 2 PLACES THIS PAGE.

TA D3	D2	D1	D0	FUNCTION
D	D	D	D	PROGRAM RAM (1K)
			D	RIGHT COIN SWITCH
		D		CENTER COIN SWITCH
	D			LEFT COIN SWITCH
D				SLAM SWITCH
				SELF TEST SWITCH
				DIAG STEP SWITCH
				HALT
				3 KHZ
D	D	D	D	OPTION SWITCH INPUTS
D	D	D	D	OPTION SWITCH INPUTS
			D	COIN COUNTER RIGHT
		D		COIN COUNTER CENTER
	D			COIN COUNTER LEFT
				VIDEO INVERT X
				VIDEO INVERT Y
				VECTOR GENERATOR GO
				WATCHDOG CLEAR
				VECTOR GENERATOR RESET
D	D	D	D	AUXILIARY PCB ENABLE
D	D	D	D	VECTOR RAM (2K)
D	D	D	D	VECTOR RAM/VECTOR ROM (2K)
D	D	D	D	VECTOR ROM (4K)
D	D	D	D	PROGRAM ROM (4K)
D	D	D	D	PROGRAM ROM (8K)

NOTE

- Indicates Edge Connector
- Indicates Interconnect Connector
- Indicates Test Point

Coin Door and Option Switch Inputs

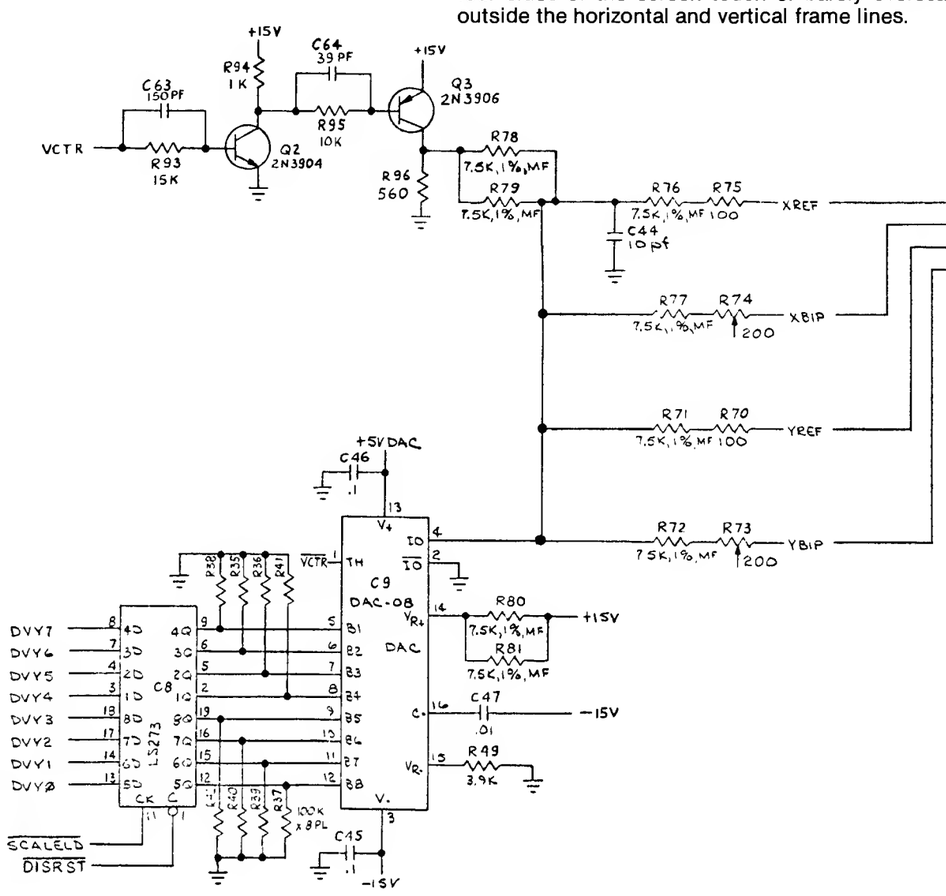


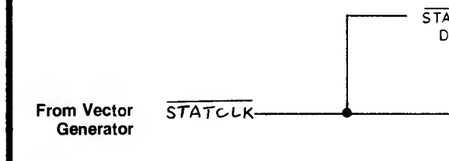
Analog Vector-Generator PCB Outputs

Adjustment of R73 and R74

If you replace the Battlezone™ Analog Vector-Generator PCB, you may have to adjust two controls on this board. Follow this procedure:

Enter the self-test. Locate the two potentiometers at R73 and R74 on the Analog Vector-Generator PCB. These control X and Y distortion. Turn the controls in either direction until the diagonal lines on all four sides of the screen touch or barely overscan outside the horizontal and vertical frame lines.





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Sheet 2, Side B
BATTLEZONE™

Analog Vector-Generator PCB
Switch Inputs
Analog Vector-Generator PCB
Video Output
Analog Vector-Generator PCB
Coin Counter Output
Section of 035742-01 & -02 B

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Sheet 2, Side B
DP-156-02 2nd printing

NOTE
- Indicates edge connector
- Indicates interconnect connector
- Indicates test point

Adjustment of R88 and R98

If you replace the Battlezone™ Analog Vector-Generator PCB or the monitor, you may have to adjust certain controls on this board or monitor. **Do not do these adjustments unless you are a qualified technician. The monitor has very high voltages near the yoke adjustment tabs!** Follow these steps:

1. Enter the attract mode. Locate the two potentiometers at R88 and R98 on the Analog Vector-Generator PCB. These control X and Y amplitude or the overall fit within the die-cut holes in the cardboard bezel. (These adjustments are roughly equivalent to horizontal width and vertical height in a raster-scan monitor.) Adjust so that the picture generally fits into the holes.

2. Enter the play mode by pushing the start button. Now carefully locate the two black tabs on the monitor yoke magnets (inside the large white ring). **Remember that the yoke area has very high voltages!** These tabs control X and Y offset.

   Adjust these tabs until the radar "screen" is within the circular hole. Then drive the tank up to one of the cubes until you bump into it. Make sure the cube does **not** overscan so it appears in the radar screen area or the rectangular message areas.

   Return to Step 1 if necessary.

From Microprocessor Address Decoder

From Microprocessor Power Reset

Stack and Program Counter

From MPU
Buffered Address
AB0 thru AB12

Vector-Ge
Address S

NOTE:
*** INSTALL RESISTOR PACK WHEN USING 74LS170 INSTEAD OF 74LS670

Vector Timer Control

Vector Timer

To Vector Generator
Memory Shifter

Sta

State Mach

Vector Halt Latch

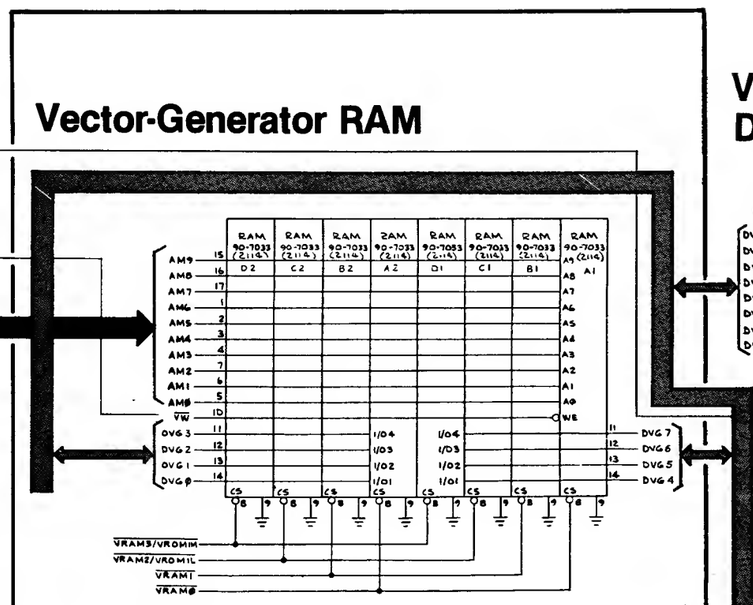
From Reset Counter

From Address Decoder

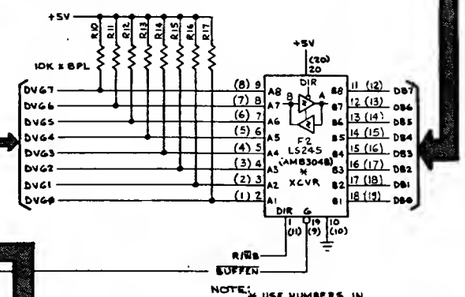
From Address Decoder

Sheet 3, Side A
DP-156-03 2nd printing

Vector-Generator RAM



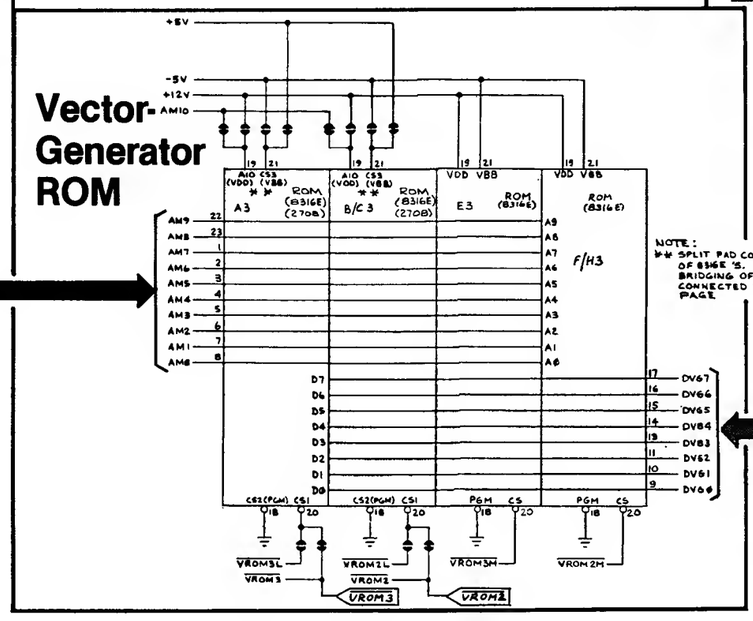
Vector-Generator Data Buffer



NOTE: * USE NUMBERS IN PARENTHESES IF BOARD CONTAINS AM8304B INSTEAD OF 74LS245

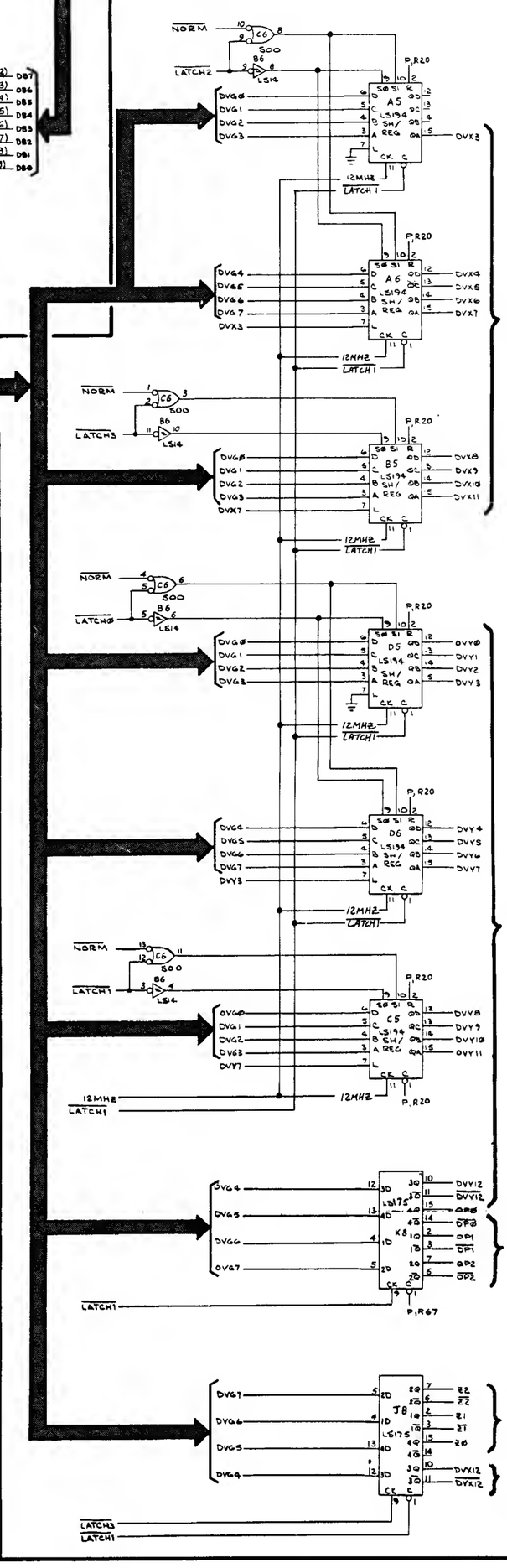
TO MPU

Vector-Generator ROM



NOTE:
** SPLIT PAD CONNECTIONS APPLICABLE TO USE OF 8316E'S. USE OF 2708'S REQUIRE BRIDGING OF OPEN PADS AND CUTTING OF CONNECTED PADS, 3 PLACES, THIS PAGE

Vector-Generator Data Shifter



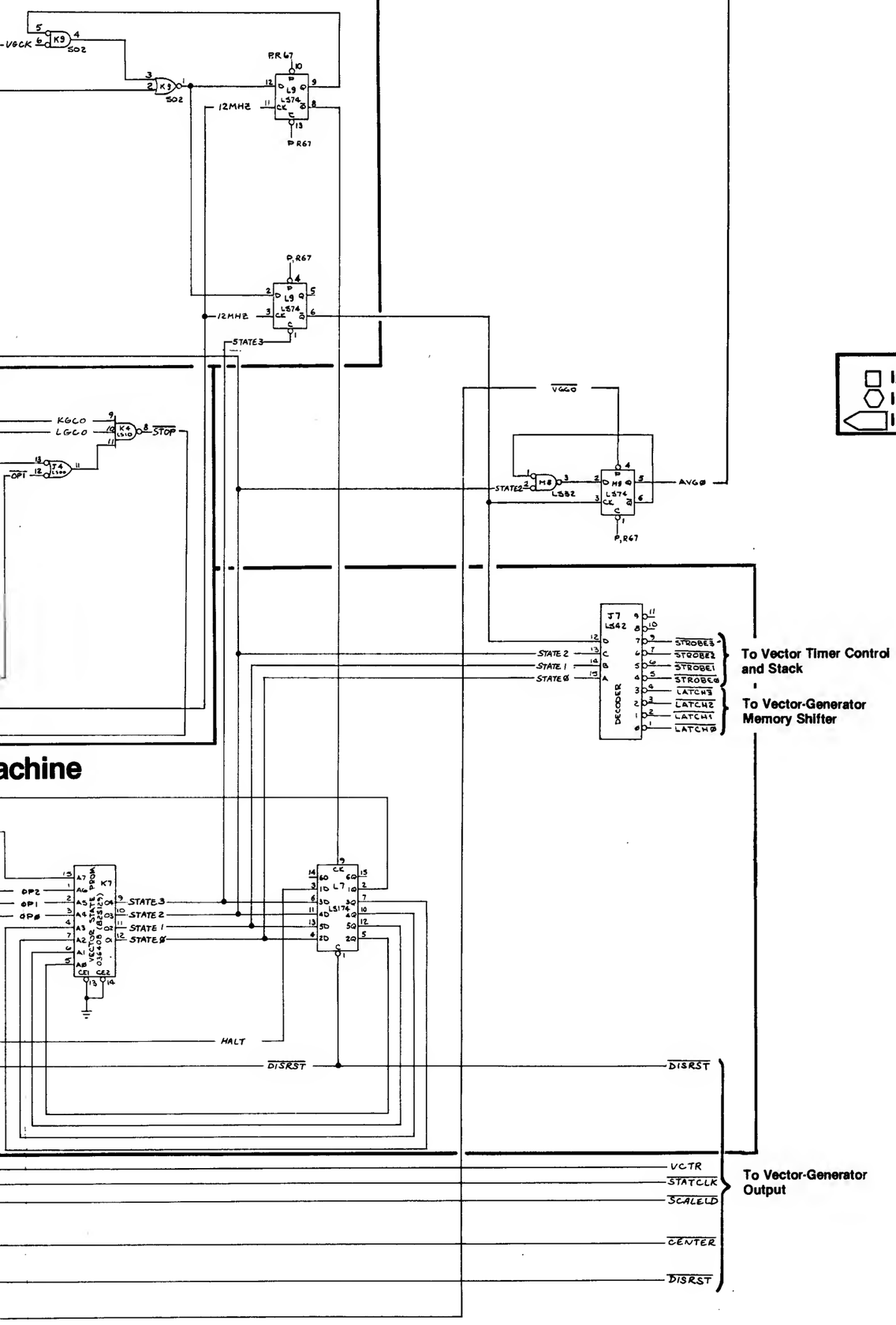
To Vector Timer Control and Vector Generator Output

To Stack Input and Vector-Generator Output

To Vector Timer Control, Vector Timer, State Machine and Stack

To Vector Timer Control and Vector-Generator Output

State Machine Control



To Vector Timer Control and Stack

To Vector-Generator Memory Shifter

To Vector-Generator Output

NOTE
- Indicates edge connector
- Indicates interconnect connector
- Indicates test point

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Sheet 3, Side A

BATTLEZONE™

Vector-Generator Program Counter
Vector-Generator RAM
Vector-Generator ROM
Vector-Generator Data Shifter
Vector-Generator Data Buffer
Vector-Generator Data Latches
Vector-Generator Vector Timer
Vector-Generator State Machine
Section of 035742-01 & -02 B

Math Box

Blue arrows indicate signal flow of each test during signature analysis.

Output Latch

Audio Output

Power Input

Control Panel Inputs and Audio Generator

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just one con

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resistor is ju
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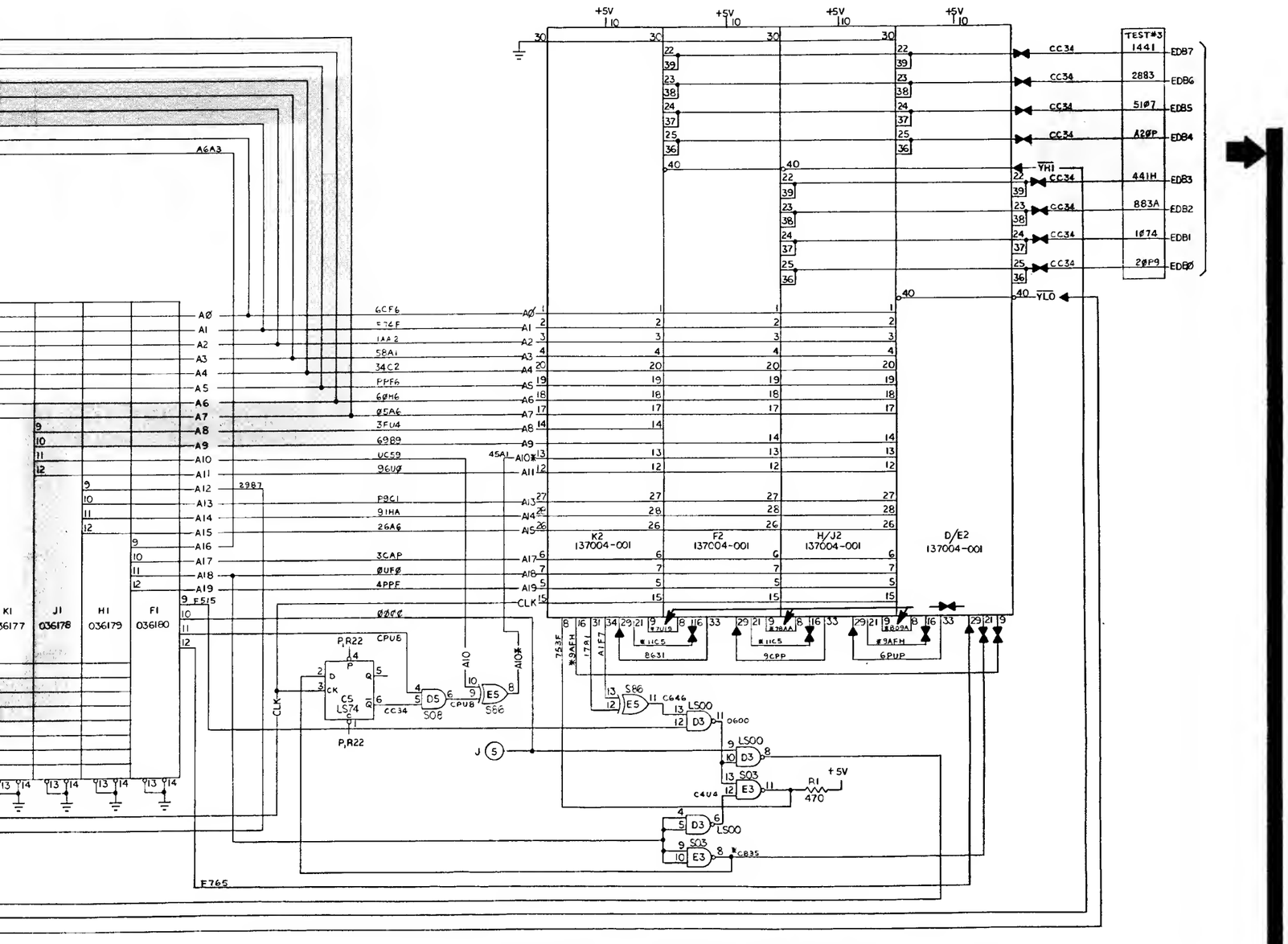
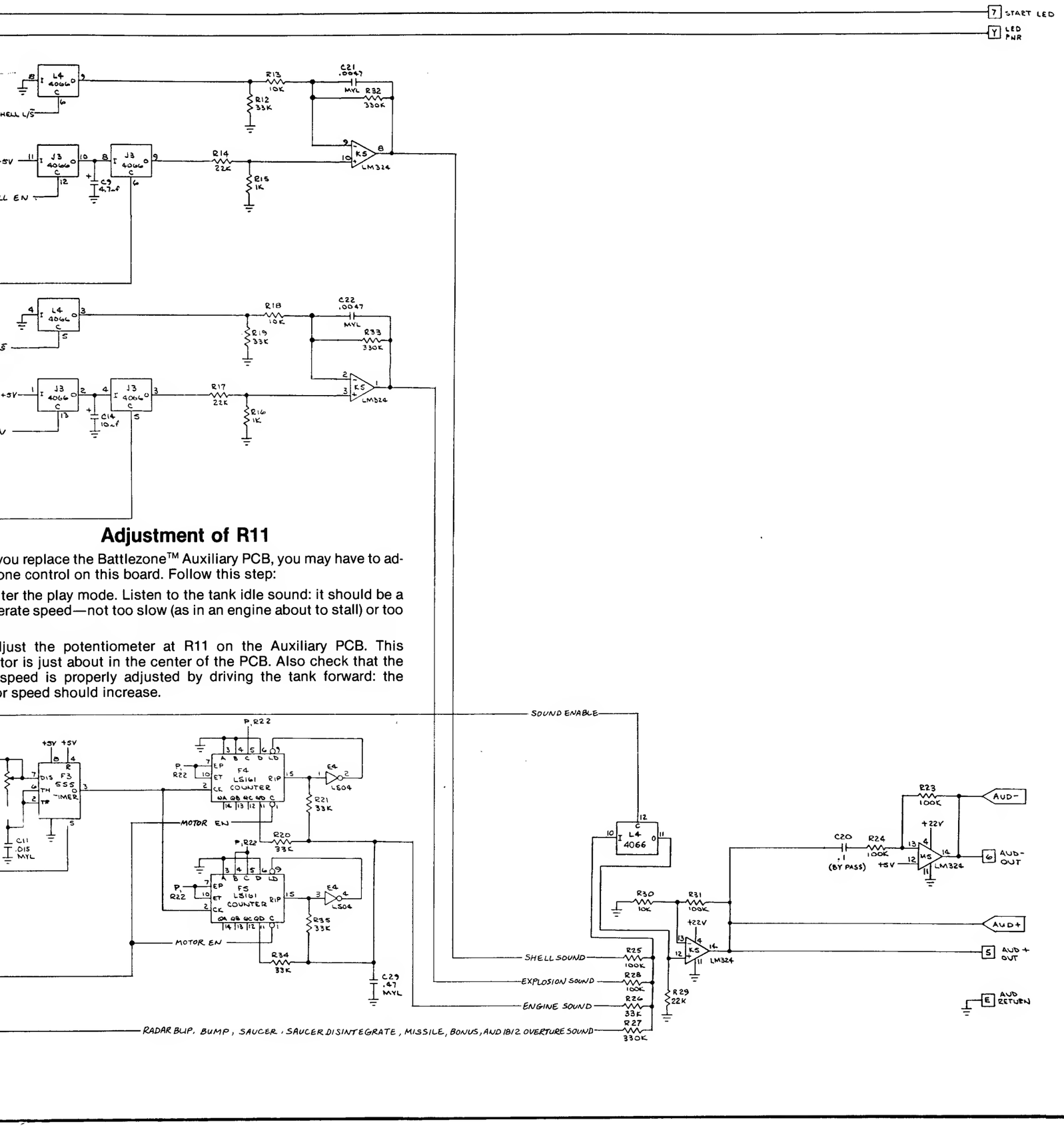
motor speed



NOTE

- ☐ Indicates edge connector
- ⬡ Indicates interconnect connector
- ◁ Indicates test point

Four-digit alphanumeric numbers are signatures of Math Box test points.
Unboxed signatures are taken during Test #1.



ATARI®

Sheet 3, Side B

BATTLEZONE™

Auxiliary PCB

Audio Output

Control Panel Inputs

Math Box

Section of 035678-01 B

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